



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

When the technology disappears

Citation for published version:

Plowman, L 2019, When the technology disappears. in C Donohue (ed.), *Exploring Key Issues in Early Childhood and Technology: Evolving Perspectives and Innovative Approaches*. 1 edn, Routledge, pp. 32-36. <https://doi.org/10.4324/9780429457425-6>

Digital Object Identifier (DOI):

[10.4324/9780429457425-6](https://doi.org/10.4324/9780429457425-6)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Exploring Key Issues in Early Childhood and Technology

Publisher Rights Statement:

This is an Accepted Manuscript of a book chapter published by Routledge in Exploring Key Issues in Early Childhood and Technology: Evolving Perspectives and Innovative Approaches on 04-07-2019, available online: <https://www.taylorfrancis.com/books/e/9780429457425>

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



When the technology disappears

Lydia Plowman

This is the author's version of a work accepted for publication in *Exploring key issues in early childhood and technology: Evolving perspectives and innovative approaches*. Changes resulting from the publishing process, such as editing, corrections and formatting may not be reflected here.

The definitive version is published as: Plowman L. (2019). When the technology disappears. In Donohue, C. (Ed.) *Exploring key issues in early childhood and technology: Evolving perspectives and innovative approaches*, pp.32-36. New York: Routledge.

<https://www.routledge.com/Exploring-Key-Issues-in-Early-Childhood-and-Technology-Evolving-Perspectives/Donohue/p/book/9781138313804>

In 1991, nearly thirty years ago, Michael Weiser wrote an article that appeared in *Scientific American* with the title "The Computer for the 21st Century". The article began with the words 'The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it'.

He was way ahead of his time. During the 1990s a personal computer was typically a large drab box connected to a power source with cables snaking between the monitor, the keyboard and the mouse. It was designed for adults to use in the workplace, not for children to use at home or in the kindergarten. Compare it with the smartphones and tablets that those of us living in wealthy economies have available to us now. The tethered desktop PC of the 1990s has almost been supplanted by these mobile devices that offer undreamed of connectivity and computational power. But, like the PC, they are still a single box – it's just that it fits in your pocket or purse.

Making predictions can be risky, but let's try some near future-gazing based on what we know already. We are now in the midst of a transition to ambient computing – a merging of our digital and physical worlds that leads to the disappearance of the boundaries between what is or is not some sort of computer. Computational devices will be everywhere and nowhere: they'll be ubiquitous in the world around us, but we won't be aware of many of them and so they won't seem to exist.

The Internet of Things provides some present-day examples of this. It is certainly ubiquitous but, as its name suggests, it primarily connects objects, devices and gadgets – in other words, things, that are visible. Although many of these things are familiar to us, they are not always what they seem because chips and sensors can be invisibly embedded in them. The concept of joining these things together is not completely unfamiliar as most of us understand that the internet connects billions of computing devices such as laptops and smartphones and that we can link our smartphones, tablets and work computers so that they can share files. Plus, there are many cases already where we're barely aware of computers. They control our

heating systems, washing machines and microwave ovens – and, beyond the home, traffic systems, street lighting and pollution trackers.

These internet connections are invisible, but once the things themselves are invisible too, our interactions with people, places and objects will change radically. As educators and parents, we should be thinking about the implications for digital play and learning when the technology is no longer clearly visible because these changes are happening fast. Ambient computing has the potential to disrupt how we interpret and interact with our physical environment because it makes possible Weiser's long-predicted disappearance of the digital device. This is not just about its external visibility: he argues that it's only when people are no longer aware of using the device that it disappears. In order to achieve this, the means of interaction needs to be so intuitive and so close to natural forms of human communication that it doesn't require a specific language or movement of the hand to achieve its purpose. The information or service it provides – whether for work or play – needs to be so integral to our everyday goals and desires that it does not impose itself on us and so we don't notice it.

This is already beginning to happen: emerging forms of gesture, gaze and voice recognition fuelled by artificial intelligence and always-on connectivity mean that keyboards and trackpads are becoming redundant. We are already beginning to see devices such as virtual assistants that use voice rather than a screen for the main form of interaction. So, screens, the means of input and the device itself could change out of all recognition.

Our practice as educators sometimes lags behind the pace of change – we see this now with children often exposed to more sophisticated technologies at home than in their early learning settings and the persistence of anxieties about screen time. Practice shouldn't be driven by technology, but educators can take an active role in ensuring that they and the children in their care benefit from these changes and the potential for adverse effects can be curbed. It may be difficult to envision the future as perceptively as Weiser, but we need to consider whether and how children's play and learning will change. Although he says that it's difficult to really give a sense of what it'll be like to live in a world full of what he calls 'invisible widgets', Weiser believes that the process of trying to think this through is worthwhile.

Technology has been associated with concerns that the child's imagination and playfulness may diminish, but if the disappearing computer means that we can play with technology without needing to think about how to do just that, perhaps we can be freed up to become more imaginative and creative by exploiting the easier interactions and more playful behaviours that are made possible. Children's early years provide a testbed for designing in ways that might offer these possibilities. Designing for young children means that written text can't be the mechanism for providing instructions or input. This can be seen as a constraint, but it frees up designers to unleash their creativity. Designing for young children in a world of ambient computing provides a wonderful opportunity to explore the ways in which technology can provide fun, pleasure and play.

But it would be naïve to think that future changes will be universally welcomed. Weiser also had the far-sightedness to predict privacy as the key issue when connected computing devices that can sense presence and record conversations and actions are everywhere. The new generation of devices can collect data on a massive scale. But rather than using watch-like activity trackers or in-app logging of data at an individual level, this can be done invisibly and unobtrusively. This raises questions about the ways in which these technologies may shape children's behavior, how the data generated by the devices from their activity is used, and to what extent children, parents and educators, are aware of, and can consent to, the technology's capabilities.

We have already seen an alert from the FBI about the privacy implications of data collected by some internet connected toys. We may feel relaxed about collecting biometric data such as heart rate and body temperature that warns of undiagnosed medical conditions. But educators may not feel so positive about learning analytics applied to data from preschool children in ways that parallel the predictive modelling used to determine the performance of university students. Rather than the records of attendance, exams and online tests used to assess older students, ambient computing makes it possible to capture a much more diverse range of data. A child's movements, gestures, facial expressions, play patterns and attempts at reading or writing can generate data that's crunched to give educators on-the-fly information about a child's learning. Some might see this as a useful opportunity for advance warning of developmental delays and learning difficulties; others might focus on the risk of branding a child as lacking in motivation or engagement at the age of three or four. The language of 'supporting' and 'improving' education and devising appropriate interventions may be more sinister than it first appears if children and their parents are not aware of the data being collected.

Perhaps this seems a bit sci fi. Soothsayers have been predicting both utopian and dystopian technological futures for many years, but it looks as if Weiser's projection into the future was uncannily accurate. The disappearance of some of the technologies with which we're familiar will probably be both exciting and scary: innovative products that open up possibilities for new forms of interaction and recognize how young children learn, create and communicate could be beneficial, but they could also compromise privacy and trust. So, this is a call to designers to heed the voices of children and educators by involving them in the co-creation of usable, playable products that meet children's cognitive, emotional and social needs. It's also a call to educators to do what they can to be aware of the emerging technologies around the corner and to find ways to ensure that they are safe, appropriate, playful and trustworthy.

Lydia's essentials

- Children often have access to new products at home before they'll be in a preschool setting. Being aware of what they play with at home and the potential uses in your own setting will enable you to keep on top of changes.

- Developing existing mechanisms to support links between home and preschool means that discussions with parents can systematically include children's experiences with home technologies in the same way that educators routinely engage parents in talk about their child's developing literacies or other changes in their learning.
- Try to avoid being dazzled or intimidated by the whizz bang nature of new products. Be careful to check products' terms and conditions and understand the data usage policy: what information is collected when registering or logging on and who has access to this data?
- It's difficult to understand the ins and outs of ambient computing, so seek advice from those in the know, if needed.
- Think about ways in which children can be introduced to some of the key concepts, such as how a toy can seem to know information about them or can 'talk' to them.

Reference

Weiser, M. (1991). "The Computer for the 21st Century." *Scientific American* 265 (3): 94-104.

Learn more about Lydia's work

Plowman L. (forthcoming, 2019) Digital toys. To appear in *The SAGE Encyclopaedia of Children and Childhood Studies*, ed. Daniel Cook. New York: Sage.

Plowman L. (2016) Rethinking context: digital technologies and children's everyday lives. *Children's Geographies* 14 (2) 190-202.

Plowman L. (2016) Learning technology at home and preschool. Chapter 6 in *Wiley Handbook of Learning Technology*, pp.96-112, eds. Nick Rushby and Dan Surry. Chichester, Sussex: John Wiley.

Plowman L., Stephen C. & McPake J. (2010) *Growing Up with Technology: Young children learning in a digital world*. London: Routledge.

Lydia recommends...

Marsh J., Plowman, L., Yamada-Rice, D., Bishop, J., Lahmar, J. & Scott, F. (2018). Play and creativity in young children's use of apps. *British Journal of Educational Technology* 49 (5) 870-882.

Marsh J., Plowman, L., Yamada-Rice, D. & Bishop, J. (2016). Digital play: A new classification. *Early Years* 36 (3) 242-253.